

# Black-necked Crane (*Grus nigricollis*) in Bhutan: Current population status and conservation initiatives

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**Abstract:** Black-necked Crane (*Grus nigricollis*) is classified as Vulnerable under the IUCN Red List Categories and legally protected in Bhutan. Bhutan is an important and the largest winter non-breeding habitat outside of the Chinese boundary. Black-necked Cranes winter in Bhutan for about five months, and they come to central (Phobjilka, Khotokha and Gyetsa) and eastern (Bumdeling) Bhutan. In Bhutan most wintering areas lie within the Conservation or protected areas, and Bumdeling and Khotokha are declared as RAMSAR site. The Royal Society for Protection of Nature and Department of Forest and Park Services initiated the counting of Black-necked Cranes in Bhutan from 1986–1987 winter. In the last 28 winters (1986–2013), the average annual number of arrivals of Black-necked Cranes in Bhutan was 415<sup>1</sup>. With only 370 Black-necked Cranes visiting Bhutan in the 1986–1987 winter to 550 Black-necked Cranes visiting Bhutan in 2013–2014 winter there has been an increase of 48.6% growth<sup>2</sup>. The average growth rate of Black-necked Cranes visiting Bhutan has increased by 1.73% (six cranes) annually in the last 28 years. Black-necked Cranes visiting Bhutan has steadily increased over the past two and a half decades. While Phobjikha valley has a gradual increase in Black-necked Crane arrivals, Bumthang, Bumdeling and Khotokha have seen fewer cranes especially after the early 1990s. For Bhutan as a whole, in the year with the highest count of Black-necked Cranes (550), this number included 63 juveniles indicating juvenile recruitment of 11.4%. Threats to these birds are mostly anthropogenic in nature driven by economic development and advancement. Around the globe, primary threats impacting Black-necked Cranes are agriculture and tourism. Conservation initiatives in these habitats include habitat rehabilitation, habitat and predation studies, awareness programs and banding research activities. Sustainable livelihood programs have also been implemented in Phobjikha and Bumdeling with the former receiving more attention. Bhutan's sound conservation policies and respect for the Black-necked Cranes as the *LhaBja* heavenly bird have provided both legal and social protection to this winter guest.

**Keywords:** Black-necked Cranes; Population; Bhutan; Winter habitats; Trends; Ramsar sites; Threats, Conservation.

## 不丹的黑颈鹤：种群现状和保护

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**摘要：**黑颈鹤 (*Grus nigricollis*) 在世界自然保护联盟濒危物种红色名录中被列为“易危”物种，在不丹也同样受法律保护。不丹是重要的、也是除中国之外的最大黑颈鹤越冬地。黑颈鹤在不丹的越冬期为 5 个月，越冬区域为不丹的中部 (Phobjilka, Khotokha 和 Gyetsa) 和东部 (Bumdeling)。不丹的黑颈鹤同步统计工作始于 1986—1987 年冬季，调查地点包括了最主要的几个越冬区，如不丹中部的 Phobjikha 和 Khotokha 以及东部的 Bumdeling。调查工作由不丹皇家自然保护学会和林业部 (现为林业和公园服务部) 发起。从 1986—1987 冬季开始，至 2013—2014 冬季 (共 28 个越冬期)，同步调查

<sup>1</sup> Average of Black-necked Crane (BNC) arrival in Bhutan in the last 28 years.

<sup>2</sup> Growth rate has been calculated based on the annual BNC peak count data available at RSPN for the past 28 winter periods.

结果表明平均每年的越冬黑颈鹤数量为 415 只<sup>1</sup>。在 1986—1987 冬季, 黑颈鹤数量仅为 370 只, 但在 2013—2014 年冬季调查中, 黑颈鹤数量已达 550 只, 增长率高达 48.6%<sup>2</sup>。在 28 年中, 平均每年的种群增长率为 1.73%, 或者说每年会增加 6 只黑颈鹤。在过去的两个半世纪中, 不丹的黑颈鹤数量一直在稳步增加。但是除了 Phobjikha 山谷地区的黑颈鹤数量在逐步增长以外, 其他几个地点, 如 Bumthang、Bumdeling 和 Khotokha 的数量却在减少, 尤其是在 20 世纪 90 年代初之后。整体来看, 在黑颈鹤统计数量最多的那一年, 共 550 只, 幼鹤数量为 63 只, 幼体新增率为 11.4%。最引人注目的保护工作是 Phobjikha 和 Bumdeling 两地均已晋升为保护地, 其中 Phobjikha 为保护区, 而 Bumdeling falls (位于 Bumdeling 野生动物庇护所) 则成为了国际重要湿地。Khotokha 和 Bumdeling 一样, 也在 2012 年成为了国际重要湿地。在 Bumthang 地区的 Thangbi falls (位于 Ugyen Wangchuck Centennial Park), 黑颈鹤同样受到了有效保护。在这些地区, 黑颈鹤受到的主要威胁是人类经济发展导致的对自然环境的破坏。今后的保护计划主要包括生境恢复、生境和捕猎研究、宣教项目、环志研究等。“可持续民生发展项目”也已在 Phobjikha 和 Bumdeling 实施, 其中在 Phobjikha 的项目尤其备受关注。在法律层面上, 针对黑颈鹤的保护政策日趋完善, 而在社会文化中, 民众一直视黑颈鹤为“*LhaBja*”, 即“天堂之鸟”, 这些均保证了黑颈鹤会得到最好的保护。

**关键词:** 黑颈鹤; 种群; 不丹; 越冬生境; 趋势; 国际重要湿地; 威胁; 保护

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In Bhutan, Phobjikha valley (1,244 ha)<sup>3</sup>, Bumdeling (141.5 ha), Khotokha (113.5 ha) and Bumthang<sup>4</sup> are considered major winter habitats of the Black-necked Cranes (*Grus nigricollis*) and all are accessible by road (c.f. Figure 1). The total habitat area is 1,499 ha. While Black-necked Cranes were previously reported in several other districts and places (Lhendup & Webb, 2009; BirdLife International (2001) and acknowledged by Chacko (1992a), no observations have been made in recent years. Black-necked Cranes are also seen in small numbers in Kurtoe in Lhuntse, Eastern Bhutan. Isolated sightings of Black-necked Cranes were reported between 2011–2013 to the Royal Society for Protection of Nature from various places such as Karbithang in Gelephu (265 m<sup>5</sup>, 4 individuals), Chuzergang in Gelephu (8 individuals), Kichu in Paro (2 individuals), Kangpara in Tashigang (3 individuals), Tshekhatang, Phochhu in Punakha (3 individuals), Kabesa in Thimphu (3 individuals), Kabesa in Punakha (3 individuals) in 2010 and 2011 and Ramtoktok in Thimphu (1 individual). While Bumdeling and Phobjikha fall under Bumdeling Wildlife Sanctuary and Phobjikha Conservation Area<sup>6</sup> respectively, Thangbi in Bumthang falls under Wangchuck Centennial National Park (WCNP). Khotokha and Gyetsa in Bumthang are located on the peripherals of the national parks. Bumdeling and Khotokha have been designated as Ramsar Site No. 2032 and Site No. 2033 respectively since 2012. The Royal Government of Bhutan has submitted the Ramsar Information Sheet to the RAMSAR Secretariat for Phobjikha. The average altitude of winter habitats in Bhutan is about 2,558.2 meters above sea level (m).

Bumdeling is the warmest and lowest habitat at 1,850 m compared to Phobjikha (2,787 m), Khotokha (2,617 m) and Gyetsa (2,639 m) and Tangbi (2,898 m) in Bumthang. Except for Bumdeling, the rest of the habitats are alpine marshland and local people mostly cultivate potato, wheat, barley, buckwheat, radish and turnip. Bumdeling is located in the eastern most part of Bhutan along the banks of the Kholong Chhu river and the people predominantly cultivate rice (c.f. Table 1). Black-necked Cranes usually arrive in Bhutan in the last week of October and fly back to their summer habitats from mid to late March after a stay of about five months. Figure 1 shows the major winter habitats of Black-necked Cranes in Bhutan namely Phobjikha and Khotokha in the Wangdue Phodrang District, Thangbi and Gyetsa in the Bumthang District and Bumdeling in the Trashi Yangtse District.

## MATERIALS AND METHODS

### Literature review

Most of the historical accounts of Black-necked

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<sup>3</sup>Only marshy area and does not include water spread (ICIMOD and RSPN, 2014).

<sup>4</sup>Bumthang represents two specific area namely Thangbi and Gyetsa within the Bumthang District. No area size data available.

<sup>5</sup>Black-necked Cranes sighted at the lowest altitude ever recorded in Bhutan.

<sup>6</sup>Phobjikha Conservation Area is recognized as Conservation Area under the Biodiversity Action Plan of Bhutan (BAP) 2002 and 2009, and National Biodiversity Strategies and Action Plan 2014.

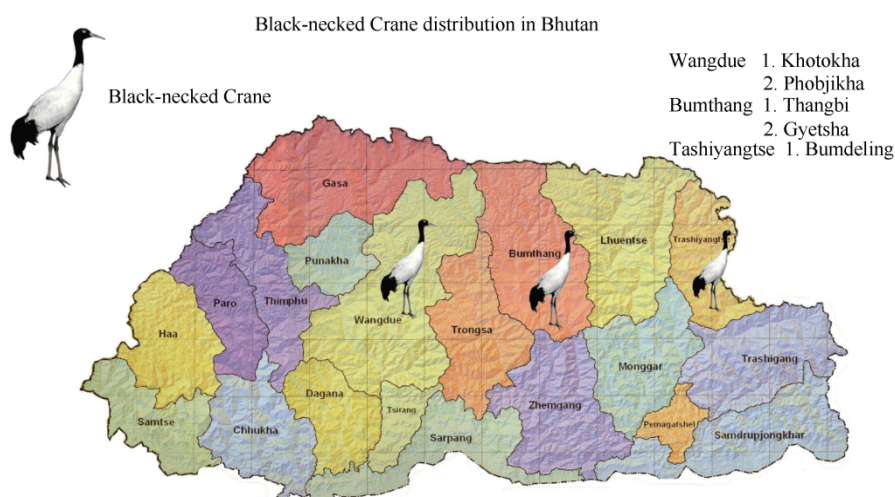


Figure 1 Major Black-necked Crane winter habitats in Bhutan

**Table 1 Principal Black-necked Crane winter habitat in Bhutan**

Habitat Name/ Ramsar site No.	Location	District	Average altitude (in meters)	Area, type and other remarks	Ranking: Crane arrival in 2013-2014 winter period
Bumdeling Site No. 2032	North Eastern Bhutan (falls under Bumdeling Wildlife Sanctuary)	Trashy Yangtse	1,850	141.5 ha. River valley and paddies. Wildlife Sanctuary. The cranes feed on both sides of the Kholong Chhu from Bumdeling to downstream Chorten Kora. The paddies above Chorten Kora serve as one of the major feeding areas.	2
Phobjikha (Ramsar Information Sheet submitted to the Ramsar Secretariat in 2013)	Central Bhutan (falls under Phobjikha Conservation Area )	Wangdue Phodrang	2,787	1,244 ha. Largest wetland in Bhutan. Alpine wetland/valley with dwarf bamboos ( <i>Yushania microphylla</i> ) dominating the terrestrial vegetation. Potato is the dominant and principal cash crop. Traditionally the local community practiced transhumance but the practice was discontinued several years ago. Two major roosting sites and feeding is dispersed within the valley. Predation of the Black-necked Crane by the common leopard has been observed.	1
Khotokha Site No. 2033	Central Bhutan	Wangdue Phodrang	2,617	113.5 ha. Alpine wetland/valley with potato fields. Often chased by stray dogs. Traditionally the local community used to practice transhumance.	3
Gyetsa	Central-north of Bhutan	Bumthang	2,639	Area size not available. Marshy area with potato fields. Often chased by stray dogs. Overhead electricity cables are seen as threat to the birds.	4
Thangbi	Central-north of Bhutan (falls under Wangchuck Centennial National Park)	Bumthang	2,898	Area size not available. River valley with potato fields	

Information Source: ICIMOD and RSPN (2014), Namgay (2013), WMD (2012), Phuntsho (2010), Lhendup (2007), Chacko (1992b), and Personal field records.

Cranes records, sightings and other observations are based on literature available on internet, peer reviewed articles and other publications. Interestingly reports, documents and video documentaries on Black-necked Cranes maintained with Conservation and Sustainable Livelihoods Program at RSPN dating as old as 1987 provide insightful past accounts. Some documents include official communications between RSPN and the Department of Forest and Park Services on crane injuries and predation reports, reports on annual crane counts and

annual crane consultative workshops, expert's field reports and other reports. RSPN's report and data of the two different crane banding programs in the past in collaboration with International Crane Foundation (ICF) (February, 1998), Japan International Cooperation Agency and the MacArthur Foundation, USA (2008) were also reviewed. Facts drawn from these documents have been very helpful in validating information and triangulating the data that is maintained with RSPN for all the Black-necked Crane habitats in Bhutan.

### Data collection and analysis

Data on the Black-necked Crane population (1986–1987 to 2013–2014 winter periods) in Bhutan was retrieved from RSPN and simple analysis was undertaken after review and screening of the data. Growth rate calculations and other analysis were conducted using a Microsoft Excel spreadsheet and a standard formula. In order to validate the data, cross referencing and triangulation of data were undertaken by reviewing other relevant literature on Black-necked Cranes in Bhutan such as Namgay (2013), Phuntsho (2010), Lhendup & Webb (2009), Lhendup (2007), BirdLife International (2001), Maine & Archibald (1996) and Chacko (1992b).

The consolidated findings based on this literature review and analysis were also presented in one of the side events “Managing Biodiversity in Trans-boundary Landscapes in the Hindu Kush Himalayas” during the Convention on Biological Diversity’s 11<sup>th</sup> Conference of Parties on 12<sup>th</sup> October 2012 in Hyderabad, India and during the Black-necked Crane Conservation Network Annual meeting held from 24<sup>th</sup> to 27<sup>th</sup> July 2013 in Caohai National Nature Reserve, China. During both of these meetings constructive feedback was received from professionals and experts associated with cranes and wetlands.

### Key Informant Interviews

Isolated Key Informant Interviews (KIIs) were conducted with people involved in Black-necked Crane conservation in Bhutan between 2011 and 2014. Interactions, especially with field officials from crane habitats during the annual Black-necked Crane workshops and annual Black-necked Crane festivals in Phobjikha were useful to further understand the ground situation of the habitats.

### Observations

Field level observations were possible on a regular basis across all the habitats. Over the years many observations have been made on the status of Black-necked Cranes, habitat and other issues in the field.

## RESULTS

### Black-necked Crane arrival and trends

The Black-necked Crane arrival data for all major

winter habitats from the 1986–1987 winter period<sup>7</sup> to the 2013–2014 winter period were reviewed and analyzed. Though there are no specific national records of whether the data obtained during the early winter periods (1986 to 1990) were based on research, Meine and Archibald (1996) indicated that field studies on Black-necked Cranes were conducted in Bhutan prior to these winters. Observations on Black-necked Cranes at several feeding and roosting areas in Bhutan were also made as early as 1978 (Chacko 1992a). It is further mentioned that Black-necked Crane surveys were conducted from the winter of 1988–1989 through 1992–1993. Bishop (1989) reports that Black-necked Crane counts for Bhutan were conducted for five locations (Phobjikha, Khotokha, Gyetsa, Kurje, Kholong Chhu and Bumdeling) between 15-12-1988 and 10-02-1989 recording 279 cranes.

Mentions have also been made about a decline in the number of Black-necked Cranes in Bumdeling from 300 to <200 between 1975 and 1987 (Paljor, undated in Meine & Archibald, 1986) and in Bumthang (Namgay, 2013). RSPN’s video documentary produced in 1989 titled “On the Wings of Prayer” also indicates a declining number of Black-necked Cranes in Phobjikha and an increase after the 1991–1992 winter period. The data maintained at RSPN does not have proper records of juvenile counts except for a few of the most recent winters. RSPN has been able to conduct a well-coordinated simultaneous vantage point count since 2002 using spotting scopes and binoculars. Since 2011, well planned national level coordinated counts have been conducted by RSPN and Department of Forest and Park Services.

Records from RSPN, show Black-necked Crane data for all major winter habitats since the 1986–1987 winter period which were based on coordinated counts with support from the then Department of Forest, Bumdeling Wildlife Sanctuary and club members of Singay Karm, Sherubtse College in Tashigang (RSPN, undated internal documents).

Beginning in 1986–1987 to the 2013–2014 winter period the annual average Black-necked Crane arrivals in Bhutan is about 415 individuals (*c.f.* Figure 2 and Annexure 1). With only 370 Black-necked Cranes visiting Bhutan in 1986–1987 winter period to 550 Black-necked Cranes visiting Bhutan in 2013–2014 winter period there has been an increase of 48.64% growth

<sup>7</sup> In Bhutan winter period span between November to March.

percentage<sup>8</sup>. The average growth rate of Black-necked Cranes visiting Bhutan has increased by 1.73% annually in the last 28 years. This would roughly translate into four BNCs per year. The sightings of Black-necked Cranes from various places (such as Gelephu, Punakha, Thimphu and Tashigang) especially from the 2010–2011 winter period to the 2013–2014 winter period are not included in the analysis since the sightings were very brief ranging from one to several days.

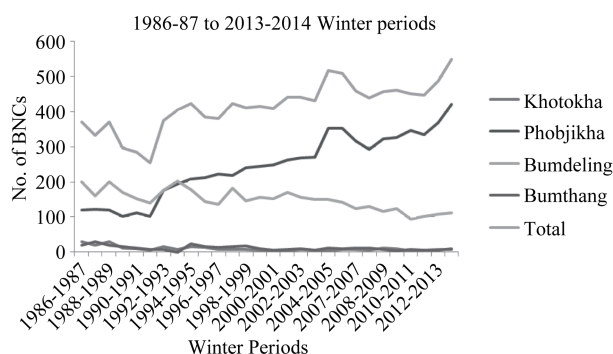


Figure 2 Black-necked Crane arrival trends in Bhutan from 1986–1987 to 2013–2014

Starting with the 2012–2013 winter period RSPN has been documenting proper data of juvenile Black-necked Cranes during the annual national counts. Juvenile recruitment, calculated from the 2013–2014 winter period data shows Phobjikha with 9.9% (42 juveniles/422 total cranes), Bumdeling with 16.9% (19 juveniles/112 total cranes) and Khotokha with 28.5% (2 juveniles/7 total cranes). No juveniles were recorded from Bumthang. For the 2012–2013 winter period juveniles were recorded from Phobjikha and Bumdeling with juvenile recruitment of 13.8% (51 juveniles/368 total cranes) and 9.3% (10 juveniles/107 total cranes) respectively.

At the national level the juvenile recruitment was 12.6% (51 juveniles/368 total cranes) in 2012–2013 winter period and 11.4% (63 juveniles/550 total cranes) in 2013–2014 winter period indicating a decrease by 1.1%.

Phobjikha has recorded 59% of the total Black-necked Crane arrivals in Bhutan followed by Bumdeling (36%), Khotokha (3%) and Bumthang (2%) (*c.f.* Figure 3). Phobjikha and Bumdeling together account for 95%

of the total arrivals. This shows the significance of these two habitats in terms of Black-necked Crane conservation in Bhutan.

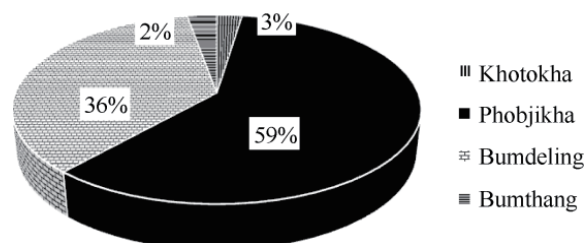


Figure 3 Long-term average (%) of Black-necked Cranes at four locations in Bhutan over the past 28 winters

Black-necked Cranes visiting Bhutan have steadily increased over the past 28 years at the national level. There have, however, been changes in the trends in terms of numbers of Black-necked Cranes visiting various places within Bhutan. Bumdeling which used to receive the highest numbers of Black-necked Cranes until 1991–1992 winter period has been gradually experiencing a decrease in the number of cranes visiting the valley. On the other hand Phobjikha saw more Black-necked Cranes year after year. Phobjikha valley received only 120 Black-necked Cranes during the 1986–1987 winter period but 10 years later it received 223 cranes (1996–1997 winter period). Again after 10 years, in 2006–2007 winter, the valley received 317 cranes. For Phobjikha there has been an increase of about 251% growth percentage in the last 28 years with an annual growth percentage rate of 8.9%. Annually, number of Black-necked Cranes visiting Phobjikha has increased with an average of 11 birds per year. For other habitats there has been negative annual growth rate of –1.6%, –2.7% and –3.2% for Bumdeling, Khotokha and Bumthang respectively which is very significant taking into account the cumulative growth rate of the last 28 years with –44%, –76.7% and –91% for the above habitats respectively (*c.f.* Table 2).

The annual Black-necked Crane count<sup>9</sup> for Bhutan for the winter period 2013–2014 was simultaneously conducted at 06:00 hours on 17 January 2014 across the Black-necked Cranes winter habitats in the country namely Phobjikha, Bumdeling, Khotokha and Bumthang.

<sup>8</sup>Growth rate has been calculated based on the annual Black-necked Crane count data available at RSPN for the past 28 winter periods.

<sup>9</sup>The count was conducted using the simultaneous vantage count method on the morning of 17<sup>th</sup> January 2014 at 06:00 hours. The count involved officials from Department of Forest and Park Services, Royal Society for Protection of Nature, volunteers and other bird enthusiasts.

**Table 2 Black-necked Crane arrival and growth rate for various habitats in Bhutan**

Black-necked Crane arrival and growth rates for various habitats in Bhutan					
	National	Phobjikha	Bumdeling	Khotokha	Bumthang
Average annual arrival ( <i>n</i> )	415.4	245.5	148.5	9.8	11.4
Growth Rate in last 28 years (%)	48.6	251.6	-44	-76.7	-91
Annual Growth Rate (%)	1.7	8.9	-1.6	-2.7	-3.2
Growth Rate in terms of number of Black-necked Cranes in 28 years (%)	6.4	10.8	-3.1	-0.8	-0.4

### Conservation of Black-necked Cranes in Bhutan

The Black-necked Cranes are an integral part of the Bhutanese culture. The Black-necked Cranes *Thrung thrung karm* are revered as the “heavenly bird” (*LhaBja*) and appear in folk songs, stories, wall paintings and embroideries. It represents and symbolizes longevity and elegance. Black-necked Cranes are legally protected in Bhutan. Both the Forest and Nature Conservation Act of Bhutan (FNCA), 1995 and the Forest and Nature Conservation Rules (FNCR) of Bhutan, 2006 have listed the bird under Schedule I as protected bird species. The FNCR and the National Biodiversity Strategies and Action Plan (NBSAP) of Bhutan, 2014, regards it as an endangered bird species.

In Bhutan RSPN has been monitoring the Black-necked Cranes in Phobjikha since 1986 and the government has leased the area to RSPN for protection and sustainable management since 2003. The Wildlife Conservation Division (WCD) under the Department of Forest and Park Services (DoFPs) looks after species conservation in the country. In Bhutan very limited studies have been conducted on Black-necked Cranes, however, a Black-necked Crane banding program began in the late 1990s. RSPN in collaboration with International Crane Foundation (ICF) banded and mounted satellite telemetry on two juveniles in 1998 (RSPN, 1998; Dietzman & Mirande, 1998). In 2006 RSPN with support from the MacArthur Foundation, USA and JICA, banded and mounted satellite telemetry on four Black-necked Cranes. In 2011, Ugyen Wangchuck Institute for Conservation and Environment (UWICE), a government research institute, initiated yet another Black-necked Crane banding program by mounting eight cranes with satellite telemetry. All the banding programs showed that Black-necked Cranes in Bhutan migrate to the Tibetan Plateau in China (Kuensel, 2013; Kuensel, 2012; RSPN, 2007). Other studies on Black-necked Cranes include habitat use and Black-necked Crane predation by common leopards.

In order to protect the Black-necked Crane winter habitats in Bhutan, government, non-governmental organizations (NGOs) and international non-government organizations (INGOs) have initiated conservation activities. RSPN has conducted various education and advocacy programs to educate stakeholders and local people on the importance of Black-necked Crane conservation, habitat conservation and coordinated monitoring of the cranes. RSPN has initiated annual programs in the country such as the Black-necked Crane winter counts, Black-necked Crane stakeholder consultation workshops in collaboration with WWF Bhutan Program, roost maintenance and monitoring and the Black-necked Crane festivals (in Phobjikha). In Phobjikha and Khotokha, RSPN have a strong presence in terms of awareness and regular monitoring. The Black-necked Crane Visitor Center in Phobjikha is solely dedicated to provide information on the bird and has facilities such as spotting scopes and portable hides. A permanent bird hide has also been built to avoid disturbance to the birds. Similarly in Bumdeling and Bumthang, the Bumdeling Wildlife Sanctuary and UWICE have strong ground presence respectively. While the Bumdeling Wildlife Sanctuary focuses on habitat rehabilitation and awareness, UWICE is focused more on habitat study and crane banding programs (*c.f.* Table 1).

The Royal Government of Bhutan through the DoFPs has supported Black-necked Crane conservation across all habitats in Bhutan. In 2012 the Royal Government of Bhutan, through the Ramsar Secretariat, declared Bumdeling and Khotokha as Ramsar wetlands of international importance, while Phobjikha awaits such recognition. In an attempt to demonstrate conservation stewardship, the government of Bhutan and the Austrian government jointly supported the eco-friendly underground electricity grid connection for the valley in 2010 to avoid overhead cables which is unsuitable for birds (Phuntsho, 2010). The respective district authorities have also supported the protection and conservation of

these habitats by providing institutional support to various organizations involved in Black-necked Crane Conservation. For instance, the local institution Phobjikha Environment Management Committee is duly recognized by the Wangduephodrang district administration.

### Threats to Black-necked Cranes

The case of threats to the Black-necked Cranes in Bhutan is not very different from other habitats in China and India. BirdLife International (2001) associates threats to the Black-necked Cranes with anthropogenic pressure and interference mostly of construction and agriculture for all the habitats. In Ladakh, India (Chandan *et al.*, 2005), major threats are unregulated development such as construction of roads and buildings near wetlands, increased tourism, improper garbage disposal, off track vehicular movements and disturbance to nesting sites by labourers. Similarly in China, habitat degradation caused by population pressure and economic development is the major threat (BirdLife International, 2001). For example in Central Tibet and north-east Yunnan Black-necked Cranes have been affected by changing agricultural practices (Li & Bishop, 1999). Another classic example of habitat degradation cited is the case of Caohai lake where deforestation has led to serious impact on the lake and wetland. The principal threats to the Black-necked Cranes and its habitats in Bhutan are land use change associated with modern developmental activities (Lhendup & Webb, 2009; Lhendup, 2007; Chacko, 1992a; Meine & Archibald, 1996). Already most of the wetlands in Phobjikha, Khotokha and Bumthang are encroached for agricultural development and other developmental activities related to urbanization. Such developments can pose a long-term threat to the survival of the birds and other associated species. For instance, in Phobjikha, people started cultivating potatoes in the early 1980s (RSPN, 2005) which accelerated in the 1990s (Pradhan *et al.*, 2004). Currently about 91% of the local community's income is generated from potato cultivation alone (Phuntsho, 2010) and 97% of the households are involved in farms and allied activities (RSPN, 2005). Between 1978 and 2010 conifer forest coverage decreased by about 2%, marshland decreased by about 1% and other land-cover types experienced subtle increases in Phobjikha. (ICIMOD & RSPN, 2014). At one time Bumthang valley was abundant with wetlands harbouring the Black-necked Cranes (Sherub, 2000) probably in large numbers

and due to disturbance the birds have dispersed from Jakar (Gole, 1981 *in litt.* BirdLife International, 2001) and further causing loss of this species from the area (Chacko, 1993 *in litt.* BirdLife International, 2001). Tourism associated infrastructure has also increased in Phobjikha. For instance in the 1990s, the valley had only one small guest house, but in 2010 there were three major hotels, two guest houses and two restaurants. Today Phobjikha has eight major hotels and large establishments in the pipeline.

Under traditional farming practices fallen grains from the harvest remained as food for the cranes. With the increasing trend of mechanized farming, the winter months may become a farming season as well, restricting the feeding areas for cranes. Replacement of food grain cultivation with cash crops such as potatoes across most habitat is already acknowledged as a concern. Farmers in Phobjikha are increasingly using chemicals on their crops which could have an adverse impact on plant succession patterns consequently altering the characteristics of the crane habitat (RSPN, 2013). Another, widely acknowledged threat to Black-necked Cranes and its habitat is tourism. Tourism associated development such as construction of facilities such as hotels and resorts can have a toll on the limited (wet)land in a particular habitat. This threat is specifically relevant to Phobjikha (Phuntsho, 2010; Lhendup, 2009) and Bumthang where tourism flow is much greater than in most places in Bhutan. Both Phobjikha and Bumthang (Gyetsa and Thangbi) have wetlands which are irreplaceable if used for developmental purposes. Threat score analysis by Lhendup and Webb (2009) indicates that Bumdeling faces a much larger set of threats than other habitats in Bhutan with land use change through settlement expansion and land development as critical threat. Next in line is Phobjikha, then Khotokha, and Thangbi which was the least disturbed habitat site. The socio-economic needs of the local people are more important than the conservation of the Black-necked Cranes in Phobjikha (Dorji & Tobgay, 2003) and other habitats.

The Black-necked Cranes in Bhutan share their habitat with the local people, therefore maintaining the needs of both the bird and the human population is becoming a challenge. Cranes are also being stalked by wild predators. In particular reference to Phobjikha, between 2007 to 2010, about 21 adult and juvenile Black-necked Crane were killed by the Common



Leopards *Panthera pardus* (Choki et al, 2011). Though no scientific study has been conducted to investigate such losses, it is a concern for crane enthusiasts and conservationists. Stray and feral dogs have been reported to cause disturbance to the cranes especially in Bumthang and Khotokha and occasionally in Bumdeling.

The changing perceptions of the native (and non-native) people may undermine the cultural values that have been protecting these birds until now and the erosion of the people's goodwill towards the birds could possibly lead to insensitive development which could have a detrimental impact on its habitat (RSPN, 2013).

## DISCUSSION AND CONCLUSION

The principal Black-necked Crane habitats in Bhutan, Phobjikha and Bumdeling, account for 95% of the total crane arrival in Bhutan with Phobjikha accounting for 59% followed by Bumdeling accounting for 36%. Considering the Black-necked Crane population concentration in these two specific habitats, it is of paramount importance to focus more conservation initiatives in these crane areas. Nonetheless, the importance of other smaller habitats should not be neglected since they serve as their traditional habitats as well. Also taking into account the anthropogenic pressure such as agriculture and tourism, efforts should be made towards reducing such pressure points through coordinated monitoring of land use change and encroachment into habitats.

The total area for principal habitats in Bhutan is about 1,499 ha which is equivalent to three ha of available habitat area per Black-necked crane<sup>10</sup>. The availability of the habitat area in the future is questionable if the trend of habitat degradation and land use change continues. Likewise arrival of more Black-necked Cranes would mean less per capita habitat availability for the birds. All habitats are also inhabited by people and therefore vulnerable to disturbance and encroachment by anthropogenic activities. Besides, apart from the roosting sites, it is also important to consider conservation of feeding areas for those are away from the main habitat. For instance close to 40 Black-necked Cranes of Bumdeling fly towards Khayber, Chortenkor, which is roughly 7.5<sup>11</sup> kilometers (crow flight distance) south and

feeds in the paddies.

Gyetsa in Bumthang is the only habitat which currently does not fall under any conservation area or alternative management programs. Therefore there is an opportunity for conservation even though it is a small area. An alternative to initiate conservation is through local groups such as Phobjikha Environment Management Group or lease the habitat for management as in the case of Phobjikha. Such local institutional arrangements will not only empower the local community but also create awareness on the importance of wetlands and the Black-necked Cranes. Though the other larger habitats such as Phobjikha, Khotokha and Bumdeling fall under conservation areas or Ramsar sites, it is important to have specific conservation plans in place for the Black-necked Crane. Institutional linkages between lead organizations need to be strengthened to share knowledge and experience and to conduct studies. Such collaborative efforts will help in development of programs and identification of proper interventions. The existing practice of annual count needs improvements in terms of standardizing the count method, identification of juvenile Black-necked Cranes and usage of better equipment. These improvements will allow the obtainment of accurate census especially for juveniles, thus allowing proper calculation of juvenile recruitment and enhance our knowledge of the bird.

The predation of the Black-necked Cranes by the Common Leopard is a major concern for conservation organizations and professionals in Bhutan. Therefore, an immediate study on this specific issue is recommended.

Considering the threats of Black-necked Cranes in Bhutan, there are opportunities for more conservation efforts especially in the light of enabling environment and government's pro-conservation policies. Focus should be made on conservation of Black-necked Cranes in Phobjikha and Bumdeling which are the two most important habitats accounting for 95% of the total arrivals. A national strategy on BNC conservation will enhance the conservation of an already well conserved species.

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<sup>10</sup> Total habitat area (excludes Bumthang) is compared against total 2013–2014 Black necked crane arrival for Phobjikha, Bumdeling and Khotokha.

<sup>11</sup> Bumdeling (N 27°37'6.00", E 91°29'50.84") to Khayber (N 27°40'9.65", E 91°26'29.33").



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## Annexure

### Annex 1 Black-necked Crane arrival data for principal habitats in Bhutan from 1986–1987 to 2013–2014 winter periods (Source: Conservation and Sustainable Livelihoods Program, RSPN)

Winter period	Khotokha	Phobjikha	Bumdeling	Bumthang	Total
1986-1987	30	120	200	20	370
1987-1988	20	122	160	30	332
1988-1989	30	120	200	20	370
1989-1990	11	102	169	15	297
1990-1991	10	111	152	12	285
1991-1992	6	102	139	8	255
1992-1993	16	175	175	8	374
1993-1994	7	195	203	0	405
1994-1995	16	208	177	23	424
1995-1996	13	212	144	16	385
1996-1997	7	223	136	14	380
1997-1998	8	219	181	15	423
1998-1999	7	240	146	18	411
1999-2000	6	244	155	10	415
2000-2001	4	248	151	6	409
2001-2002	4	262	169	7	442
2002-2003	8	269	155	9	441
2003-2004	6	270	150	5	431
2004-2005	4	352	149	12	517
2005-2006	7	353	141	9	510
2006-2007	7	317	123	12	459
2007-2008	6	292	130	12	440
2008-2009	11	322	116	8	457
2009-2010	9	326	123	4	462
2010-2011	3	347	94	8	452
2011-2012	5	335	102	5	447
2012-2013	7	368	107	5	487
2013-2014	7	422	112	9	550